

## CHAPTER

1

## Study Guide

## Key Concepts

## 1.1 Chemistry

- Because living and nonliving things are made of matter, chemistry affects all aspects of life and most natural events.
- Chemistry can be divided into five traditional areas of study: organic chemistry, inorganic chemistry, biochemistry, analytical chemistry, and physical chemistry.
- Pure research can lead directly to an application, but an application can exist before research is done to explain how it works.
- Chemistry can be useful in explaining the natural world, preparing people for career opportunities, and producing informed citizens.

CHAPTER  
3

## Study Guide

## 3.2 The International System of Units

- Five commonly used SI base units are the meter, kilogram, kelvin, second, and mole.
- Common metric units of length: cm, m, km.

## CHAPTER

4

## Study Guide

## Key Concepts

## 4.1 Defining the Atom

- Democritus believed that atoms were indivisible and indestructible.
- By using experimental methods, Dalton transformed Democritus's ideas on atoms into a scientific theory.
- Scientists can observe individual atoms by using instruments such as scanning tunneling microscopes.

## 4.2 Structure of the Nuclear Atom

- Three types of subatomic particles are electrons, protons, and neutrons.
- In the nuclear atom, the protons and neutrons are located in the nucleus. The electrons are distributed around the nucleus and occupy almost all the volume of the atom.

## 4.3 Distinguishing Among Atoms

- Elements are different because they have different numbers of protons.
- The number of neutrons in an atom is the difference between the mass number and atomic number.
- Because isotopes of an element have different numbers of neutrons, they also have different mass numbers.
- To calculate the atomic mass of an element, multiply the mass of each isotope by its natural percent abundance (expressed as a decimal), and then add the products.
- The periodic table lets you easily compare the properties of one element (or a group of elements) to another element (or group of elements).



## CHAPTER

6

## Study Guide

## Key Concepts

## 6.1 Organizing the Elements

- Chemists used the properties of elements to sort them into groups.
- Mendeleev arranged the elements in his periodic table in order of increasing atomic mass.
- In the modern periodic table, elements are arranged in order of increasing atomic number. The elements within a group in the table have similar properties.
- Three classes of elements are metals, nonmetals, and metalloids.

## 6.2 Classifying the Elements

- The periodic table displays the symbols and names of elements, along with information on the structure of their atoms.
- Elements can be sorted into noble gases, representative elements, transition metals, or inner transition metals based on their electron configurations.
- The periodic table can be divided into *s*, *p*, *d*, and *f* blocks that correspond to the highest occupied sublevels in atoms of elements.

$$\text{number of neutrons} = \text{mass number} - \text{atomic number}$$

## Key Equation

## CHAPTER

5

## Study Guide

## Key Concepts

## 5.1 Models of the Atom

- Rutherford's planetary model could not explain the chemical properties of elements.
- Bohr proposed that electrons move only in specific circular paths, or orbits, around the nucleus.
- The quantum mechanical model determines the allowed energies an electron can have and how likely it is to be found in various locations around the nucleus.
- Each sublevel of a principal energy level corresponds to an orbital shape describing where the electron is likely to be found.

## 5.2 Electron Arrangement in Atoms

- Three rules—the aufbau principle, the Pauli exclusion principle, and Hund's rule—tell you how to find the electron configurations of atoms.

## Vocabulary

- chemical change (p. 48)
- chemical property (p. 53)
- chemical reaction (p. 53)
- chemical symbol (p. 51)
- compound (p. 48)
- distillation (p. 47)
- element (p. 48)
- extensive property (p. 39)
- filtration (p. 46)

- gas (p. 42)
- heterogeneous mixture (p. 45)
- homogeneous mixture (p. 45)
- intensive property (p. 39)
- law of conservation of mass (p. 53)
- liquid (p. 41)
- mass (p. 39)
- mixture (p. 44)

- physical change (p. 42)
- physical property (p. 40)
- precipitate (p. 54)
- product (p. 53)
- reactant (p. 53)
- solid (p. 41)
- solution (p. 45)
- substance (p. 40)
- vapor (p. 42)
- volume (p. 39)

## Vocabulary

- atom (p. 101)
- atomic mass (p. 115)
- atomic mass unit (amu) (p. 114)
- atomic number (p. 110)
- cathode ray (p. 104)
- Dalton's atomic theory (p. 102)
- electron (p. 104)
- group (p. 118)
- isotopes (p. 112)
- mass number (p. 111)

- neutron (p. 106)
- nucleus (p. 107)
- period (p. 118)
- periodic table (p. 118)
- proton (p. 106)

Format Of Test: Multiple Choice/Matching/Short Response/Calculation

Sections covered: 1.1, 2(all), 3.3, 4(all), 5.1, 5.2, 6.1, 6.2, half-life calculations, average atomic mass